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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
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09/513,067 02/24/00 DE SIMMONE

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EXAMINER

024251 MM91/1031
SKJERVEN MORRILL MACPHERSON LLP
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SAN JOSE CA 95110

ART UNIT

PAPER NUMBER

2825
DATE MAILED:

10/31/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/513,067

Applicant(s)

DE SIMMONE ET AL.

Examiner

Chuong A Luu

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 August 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6-7, 10-14, and 16-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-7, 10-14, and 16-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____.

DETAILED ACTION
PRIOR ART REJECTIONS

Statutory Basis

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The Rejections

Claims 1-2, 6, 10-11, 30, and 32-34 are rejected under 35 U.S.C. 102(e) as being anticipated by Masaki (U.S. 6,166,446)

Masaki discloses a semiconductor device with

(1) a semiconductor chip 104; a package body formed of a hardened encapsulant material 107; a plurality of metal leads 101, 108, wherein each lead is electrically connected to the chip; a flat metal plate 103 fully encapsulated within said

package body, wherein the chip 104 is mounted on the plate 103 and an encapsulated first portion of each of the leads overhangs a periphery of the plate; a plurality of electrically isolated, encapsulated members; wherein each said member extends from an edge of the package body toward said plate 104 and overhangs the periphery of the plate; wherein said metal plate is a connection with each said member (see Figure 1);

(2) wherein the plate is comprised of copper and has a CuO or CU₂O film on all surfaces thereof (see column 4, lines 8-9);

(6) wherein each said member extends from a corner of said package body (see Figure 1);

(11) wherein the encapsulant material is between said plate and the first portion of the leads (see Figure 1).

(10) wherein the plate is formed of metal, and the metal plate has a thickness that is at least two times a thickness of said leads (see Figure 1);

(32) wherein the encapsulant material is between said plate and the first portion of the leads (see Figure 1);

(33) wherein a protrusion of the flat metal plate is stamped or swaged against the respective member, thereby forming the metal to metal connection (see Figure 1);

(34) wherein at least a plurality of the leads increase in width as those leads extend from the perimeter of the package body toward the plate (see Figure 1).

Claims 3, 7, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki (U.S. 6,166,446) in view of Jeng et al. (U.S. 5,783,860)

Masaki teaches everything above except for wherein an electrically insulative, thermally conductive adhesive layer. However, Jeng discloses heat sink bonded to a die paddle with (3) wherein an electrically insulative, thermally conductive adhesive layer 70 is attached between the first portion of the leads and the plate, and said layer is covered by said encapsulant material; (7) wherein the metal plate is connected to said members by an electrically insulative, thermally conductive adhesive layer; (31) wherein an electrically insulative, thermally conductive adhesive layer is attached between the first portion of the leads and the plate, and the adhesive layer is covered by the encapsulant material (see column 5, lines 29-31. Figure 4). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Masaki and Jeng to fabricate a semiconductor package to exceed the performance criteria

Claims 12, 16, 17, 19, 20, and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoo et al. (U.S. 5,661,338)

Yoo discloses chip mounting plate construction of lead frame for semiconductor package with

(12); (37) a metal frame 1 including a central region within the frame;

a plurality of metal leads extending from a first end integral with the frame to a second end adjacent to the central region, wherein at least a plurality of the leads T1, T2 increase in width as those leads extend from the frame toward the central region;

a flat metal plate supported in the central region, wherein a first portion of each said lead overhangs a periphery of said plate (see Figures 2, 4);

(16) further comprising a plurality of electrically isolated members extending from said frame adjacent to said leads; wherein each said member overhangs the periphery of the plate and is in a connection with said plate (see Figure 3);

(17) wherein each said member extends from corner of said frame (see Fig. 3);

(19) wherein each connection is a metal to metal connection between the plate and the respective member (see Figure 3);

(40) wherein each of the connections between the plate and the first portions of the tie bars comprises a metal to metal connection;

(41) wherein said first slot is between two pair of adjacent leads of increasing width, wherein each said pair includes one of the two leads defining the first slot, and wherein the two adjacent leads of each said pair define an open second slot between them, and each of the second slots has a width, and the width of the second slots each are less than the width of the first slot;

(42) wherein the first slot increases in width and then decreases in width from the frame toward the central region;

(43) further comprising a short tapered metal first member integral with the first corner of the frame and extending into the first slot for only a portion of a length of the first slot (see Figures 3-7)

Claims 13, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo et al. (U.S. 5,661,338) in view of Masaki (U.S. 6,166,446)

Yoo teaches the above outlined features except for specific use of metal as a CuO or Cu₂O. However, Masaki discloses a semiconductor device with **(13)** wherein the plate is comprised of copper and has a CuO or Cu₂O film on all surfaces thereof (see column 4, lines 8-9); **(20)** wherein the plate is formed of metal, and the metal plate has a thickness that is at least two times a thickness of said leads (see Figure 1). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ specific metal materials such as CuO or Cu₂O.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo et al. (U.S. 5,661,338) in view of Masaki (U.S. 6,166,446) and further view of Jeng et al. (U.S. 5,783,860)

Yoo and Masaki teach everything above except for wherein an electrically insulative, thermally conductive adhesive layer. Furthermore, Jeng discloses heat sink bonded to a die paddle with **(14)** wherein an electrically insulative, thermally conductive adhesive layer 70 is attached between the first portion of the leads and the plate; **(18)** wherein the metal plate is connected to said members by an electrically insulative, thermally conductive adhesive layer (see column 5, lines 29-31). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Yoo, Masaki, and Jeng to fabricate a semiconductor package to exceed the performance criteria.

Claims 21-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki (U.S. 6,166,446) in view of Yoo et al. (U.S. 5,661,338)

Masaki teaches everything above except for wherein at least a plurality of the leads increase in width as those leads extend from the perimeter of the package body toward the plate. However, Yoo discloses chip mounting plate construction of lead frame for semiconductor package with **(21)** wherein at least a plurality of the leads increase in width as those leads extend from the perimeter of the package body toward the plate; **(22)** wherein two leads of increasing width are adjacent and extend from opposite sides of a first corner of the perimeter of the package body, said two leads defining a first slot between them, said first slot extending from the first ends of the two leads to their respective second ends and filled with the encapsulant material; **(23)** further comprising a short tapered metal first member located at the first corner of the perimeter of the package body and extending into the first slot for only a portion of a length of the first slot; **(24)** wherein three of said plurality of encapsulated members each extend diagonally from a first end located at a second corner, a third corner, and a fourth corner, respectively, of the perimeter of the package body to a second end overhanging the periphery of the plate; **(25)** wherein two leads of increasing width are adjacent and extend from opposite sides of a first corner of the frame, said two leads defining an open first slot between them, said first slot extending from the first ends of the two leads to their respective second ends; **(26)** further comprising a short tapered metal first member integral with the first corner of the frame and extending into the first slot for only a portion of a length of the first slot; **(27)** further comprising three metal

pseudo tie bars each extending diagonally from a first end integral with a second corner, a third corner, and a fourth corner, respectively, of the frame to a second end overhanging the periphery of the plate; **(28)** wherein each pseudo tie bar includes a first portion at the second end overhanging the periphery of the plate, a second portion adjacent to the first end integral with the respective corner of the frame, and a third portion between the second portion and the first portion, wherein the second portion is wider than the third portion and has edges that taper into the third portion (see Figure 3); **(29)** wherein each said metal to metal connection is between the respective member and a protrusion from a surface of the plate, and the protrusion is stamped or swaged against the respective member to form the metal to metal connection (see Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Masaki, and Yoo to fabricate a semiconductor package to exceed the performance criteria.

Claims 35-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki (U.S. 6,166,446) in view of Yoo et al. (U.S. 5,661,338)

Masaki discloses semiconductor device with **(35)** a semiconductor chip 104; a package body formed of a hardened encapsulant material 107; a plurality of metal leads 108, 106 each electrically connected to the chip 104, wherein at least a plurality of the leads 108, 101 increase in width as those leads 108, 101 extend from a perimeter of the package body, a flat metal plate 103 fully encapsulated within said package body, wherein the chip 104 is mounted on the plate 103, and an encapsulated first portion of

each of the leads overhangs a periphery of the plate 103, and the plate 103 has a thickness that is at least two times a thickness of the leads 108, 101 (see Figure 1).

Masaki teaches everything above except for wherein two leads of increasing width are adjacent and extend from opposite sides of a first corner of the perimeter of the package body, said two leads defining a first slot between them, said first slot extending from the first ends of the two leads to their respective second ends. However, Yoo discloses chip mounting plate construction of lead frame for semiconductor package with **(35)**.... wherein two leads of increasing width are adjacent and extend from opposite sides of a first corner of the perimeter of the package body, said two leads defining a first slot between them, said first slot extending from the first ends of the two leads to their respective second ends; a metal first member located at a first corner of the package body and extending into the first slot for only a portion of a length of the first slot, the first member being encapsulated by the package body and including intersecting straight edges that taper to a point aligned with a central axis of the first slot; and three metal pseudo tie bars each extending diagonally from a first end located at a second corner, a third corner, and a fourth corner, respectively, of the perimeter of package body to a second end overhanging the periphery of the plate and each being in a connection with the plate (see Figure 3); **(36)** wherein each pseudo tie bar includes a first portion at the second end overhanging the periphery of the plate, a second portion adjacent to the first end located at the respective corner of the perimeter of the package body, and a third portion between the second portion and the first portion, wherein the second portion is wider than the third portion and has edges that

taper into the third portion (see Figures 3, 5). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Masaki, and Yoo to fabricate a semiconductor package to exceed the performance criteria.

Claims 38, 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo et al. (U.S. 5,661,338) in view of Jeng et al. (U.S. 5,783,860)

Yoo teaches everything above except for wherein an electrically insulative, thermally conductive adhesive layer. However, Jeng discloses heat sink bonded to a die paddle with **(38)** wherein an electrically insulative, thermally conductive adhesive layer is attached between the first portion of the leads and the plate; **(39)** wherein each of the connections between the plate and the first portions of the tie bars comprises an electrically insulative, thermally conductive adhesive layer (see column 5, lines 29-31). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Yoo, Masaki, and Jeng to fabricate a semiconductor package to exceed the performance criteria.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

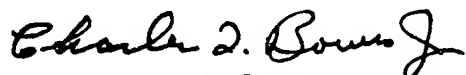
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A Luu whose telephone number is (703)305-0129. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703)308-1323. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Chuong Anh Luu
Assistant Examiner

CAL
October 26, 2001



Charles Bowers
Supervisory Patent Examiner
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